

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
BUREAU OF AIR, PERMIT SECTION
1021 N. GRAND AVENUE EAST
P.O. BOX 19276
SPRINGFIELD, ILLINOIS 62794-9276
217/782-2113

PROJECT SUMMARY
FOR A CONSTRUCTION PERMIT APPLICATION
FROM
INDECK-ROCKFORD II, L.L.C.
FOR A
PEAKING POWER PLANT
ROCKFORD, ILLINOIS

Site Identification No.: 201030BCO
Application No.: 00100077
Date Received: October 30, 2000

Schedule

Public Comment Period Begins: May 5, 2001
Public Hearing: June 19, 2001
Public Comment Period Closes: July 6, 2001

Illinois EPA Contacts

Permit Analyst: Manish Patel
Community Relations Coordinator: Brad Frost

I. INTRODUCTION

Indeck-Rockford II, L.L.C. (Indeck) has proposed to construct a second electrical generation facility in Rockford, Winnebago County. Facility would be located next to Indeck's existing peaking power plant, within the Rock River Valley Industrial Park. This facility would use a gas turbine to generate up to 166 MW of electricity in Phase 1 (simple cycle configuration) and later up to 254 MW of electricity in Phase 2 (combined cycle configuration). The construction of the proposed facility requires a permit from the Illinois EPA because of its associated air emissions.

II. PROJECT DESCRIPTION

A gas turbine is a rotary internal combustion engine with three major parts: an air compressor, burner(s), and a power turbine. In the air compressor, a series of bladed rotors compresses the incoming air from the atmosphere. A portion of this compressed air is then diverted through the combustors or burners, where fuel is burned, raising the temperature of the compressed air. This very hot gas is mixed with the rest of the compressed air and passes through the power turbine. In the power turbine, the force of the hot compressed gas as it expands pushes another series of blades, rotating a shaft. Much of the mechanical energy produced by the power turbine is consumed to drive the air compressor. The remainder is available to perform useful work and in the case of a simple cycle gas turbine power plant, the power turbine turns an electric generator and makes electricity.

The project has been proposed to be completed in two Phases. In Phase 1, the turbine will be constructed and used in simple cycle configuration. The turbine would be used initially in a simple cycle configuration, with all electricity produced by a generator connected to the shaft of the turbine.

During Phase 1, the facility is expected to function as a peaking station, to generate electricity in the peak demand periods, and at other times when other power plants are not available due to scheduled or unexpected outages. Operation of the facility may occur throughout the year, although the facility is expected to run primarily in the summer months. In Phase 2, construction involves the heat recovery steam generator (HRSG) with duct burner and the steam turbine, expansion of the switchyard and placing auxiliary equipment such as cooling tower, switchgear, water supply and treatment equipments, tanks, etc.

The combined-cycle unit will include a natural gas fired combustion turbine, a heat recovery steam generator equipped with supplemental firing capability, and a steam turbine generator. The combustion turbine will exhaust to a supplementary-fired HRSG. The generator located on the shaft of the combustion turbine will only provide a portion of the facility's electric output. The steam produced from the associated HRSG will be routed to the steam turbine generating units to provide additional electrical output. The HRSG can produce steam using the hot turbine exhaust and firing supplementary burners in the HRSG to increase the amount of steam output to allow maximum utilization of the steam turbine generator capacity. After completion of the combined cycle phase, the simple cycle stack will be removed and capped. From that point onward, the facility will be operated in combined cycle configuration only. This facility in Phase 2 expected to function as an intermediate power supply station, to generate electricity in the peak demand periods as well as at other times when the demand for power can not be met by base load from coal and nuclear power plants.

The principal air contaminants emitted from the proposed turbine and duct burner would be NO_x and CO. NO_x can be formed thermally by combination of oxygen and nitrogen in the air at the temperatures at which fuel is burned. Thermal NO_x is formed during the operation of all common high temperature combustion processes including turbines. NO_x can also be formed from the combination of any nitrogen in

the fuel with oxygen. This is not relevant for burning of natural gas, which contains minimal amounts of nitrogen. Factors affecting NO_x formation from a turbine include design, ambient conditions, turbine load, and fuel types.

The NO_x emissions from the turbine, in Phase 1 (simple cycle configuration), will be controlled through low NO_x combustors. In Phase 2 (combined cycle configuration), use of add-on Selective Catalytic Reduction (SCR) in the HRSG will be employed. Low NO_x combustors lower NO_x formation by controlling flame turbulence and staging the mixing of fuel and combustion air. SCR uses a catalyst operated in an appropriate temperature range that normally is present in one section of the HRSG to control NO_x, by reaction with ammonia, urea, or other similar chemicals. The NO_x is converted back into nitrogen and oxygen, as originally present in the atmosphere, and water is formed as a byproduct.

CO is formed by the incomplete combustion of fuel. CO is associated with most combustion processes and is found in measurable amounts in turbine exhaust. VOM and PM/PM₁₀ are also emitted as a result of incomplete combustion of fuel. SO₂ is found only in trace amounts from combustion of natural gas.

CO and VOM emissions are controlled by providing adequate fuel residence time and high temperature in combustion zone to ensure complete combustion. PM/PM₁₀ are controlled by proper combustion control and firing natural gas fuel, which has negligible ash content.

III. PROJECT EMISSIONS

Emissions of carbon monoxide (CO), nitrogen oxide (NO_x), particulate matter/particulate matter <10 microns (PM/PM₁₀), sulfur dioxide (SO₂) and volatile organic material (VOM) would result from the combustion of fuel in the turbine and in the duct burners.

The annual emissions limits for the facility are shown in the table below. These limits are based on the maximum emissions requested by Indeck. NO_x and CO limits are based on achievement of average annual hourly emission rate and the potential utilization of the facility as specified by Indeck. Actual annual emissions of the facility would be less than these limits to the extent that the actual performance of the turbine and duct burner is expected to be better than projected and the turbine and duct burner are not utilized as much.

Potential Project Emissions (ton/yr)		
Pollutant	Phase 1	Phase 2
NO _x	97.0	98.1
CO	22.7	98.7
VOM	8.0	39.0
PM/PM ₁₀	6.0	32.9*
SO ₂	0.9	4.1

* Includes 4.6 tons of PM emissions from the cooling tower.

Emissions from startup of the turbine would be considered when determining compliance with annual emission limits. In particular, in simple cycle configuration, during startup of the turbine, it is expected that NO_x and CO emissions will be higher than during normal operation. In Phase 2, because startup will occur much more gradually in combined cycle configuration, it is expected that emissions during startup will be within the permitted short-term normal operation emission limit.

IV. APPLICABLE EMISSION STANDARDS

All emission sources in Illinois must comply with the Illinois Pollution Control Board's emission standards. The Board's emission standards represent the basic requirements for sources in Illinois. The proposed project will readily comply with applicable state emission standards (35 Ill. Adm. Code, Subtitle B).

The turbine is also subject to the federal New Source Performance Standards (NSPS), 40 CFR 60 Subpart GG, for Stationary Gas Turbines. The Illinois EPA is administering NSPS in Illinois on behalf of the United States EPA under a delegation agreement. These standard addresses NO_x emission from gas turbines limiting NO_x emissions to 75 ppm, adjusted for actual turbine efficiency. The project should readily comply with this standard. The application indicates NO_x emissions typically would be no more than 15 ppm in Phase 1, and 3.5 ppm in Phase 2.

V. APPLICABLE REGULATORY PROGRAMS

This facility is not considered a major project under the federal rules for Prevention of Significant Deterioration of Air Quality (PSD), 40 CFR 52.21. For this purpose, the construction of this facility is considered to be a separate project from development of the generating facility already at the source, which facility began operation in the summer of 2000. The application demonstrates that the development of this facility was not planned when the existing plant was developed. The potential emissions from the proposed facility, as limited by the permit, would be less than the major source thresholds for PSD, i.e., nitrogen oxides, sulfur dioxide, carbon monoxide, and particulate matter are limited to less than 100 tons/year.

The facility is an Electric Generating Unit (EGU) for purposes of Part 217, Subpart W. As EGU, when this program becomes effective, the Permittee would have to hold NO_x allowances for the NO_x emissions of the turbine and duct burner during each seasonal control period.

Indeck's Rockford complex is considered a major source under Illinois Clean Air Act Permit Program (CAAPP) pursuant to Title V of the Clean Air Act. This is because the plant's potential emissions would be greater than 100 tons/year, which is the relevant applicability threshold under the CAAPP. Accordingly, Indeck must have a CAAPP operating permit for the operation of the proposed facility. Indeck would also have to permit the facility as an affected source under the federal acid rain program because the facility can generate more than 25 MW of electricity.

VI. AIR QUALITY IMPACTS

With its application, Indeck submitted an air quality impact analysis for NO_x, CO, SO₂, and PM. This analysis addressed both the proposed facility and the existing peaking power plant. The analysis shows that the proposed facility would not significantly affect ambient air quality in the vicinity of the facility. This is consistent with the Illinois EPA's experience with other new natural gas fired power plants.

VII. PROPOSED PERMIT

The conditions of the draft permit for the facility contain limitations and requirements for the turbine and duct burner to help assure that the facility complies with applicable regulatory requirements. The draft permit also identifies measures that must be used as good air pollution control practices to minimize emissions from the turbine and duct burner.

The draft permit includes enforceable limits on emissions and operation for the turbine and duct burner to assure that facility remains below the levels at which it would be considered major for PSD (i.e. 100 tons/year for NO_x, CO, PM, SO₂ and VOM). In addition to limiting annual emissions, the permit also includes limits on hourly emissions, limitations on the amount of fuel that can be used in the turbine and duct burner and their annual hours of operation.

The permit also establishes appropriate compliance procedures for the facility, including requirements for emission testing, monitoring, recordkeeping, and reporting. Continuous monitoring of NO_x emissions is required for the turbine and duct burner to confirm actual levels of operation. Emission testing is required as part of the initial shakedown and operation of the turbine and duct burner after completion of construction. Testing must be conducted under a number of different operating scenarios to account for the expected range of operation of the facility.

These measures are being imposed to assure that the emissions of the turbine and duct burner are accurately tracked to confirm compliance with both the short-term and annual emission limits established for them, considering the variation in emissions based on turbine load and ambient temperature.

VIII. REQUEST FOR COMMENTS

It is the Illinois EPA's preliminary determination that the proposed permit meets all applicable state and federal air pollution control requirements. The Illinois EPA is therefore proposing to issue this permit.

Comments are requested on this proposed action by the Illinois EPA and the proposed conditions of the draft permit.